

No. 1

mass = 1 kg

P1 = 30 bar

X1 = 0.925

From 1 to 2 P = Const.

T2 = 420 °C

P2 = 30 bar

From 2 to 3 V = Const.

V3 = V2

From 3 to 1 Pv = Const.

v = xvg

v1 = 0.925x0.665 = 0.06165125 m³/kg

T1 = 233.8 °C

T	400	420	450
v	0.0993	vg	0.1078

$$\frac{450-400}{450-420} = \frac{0.1078-0.0993}{0.1078 - v_g}$$

vg2 = 0.1078 m³/kg

P1V1 = P3V3

P3 = 18 bar

vg3 = 0.1104 m³/kg

T3 = 207.1 °C

X3 = $\frac{0.1027}{0.1104} = 0.93$

$$W_{1-2} = 30(0.1027 - 0.06165) \times 105 = 123.15 \text{ kJ/kg}$$

$$W_{2-3} = 0$$

$$W_{3-1} = -94.385 \text{ kJ/kg}$$

$$Q_{1-2} = H_2 - H_1$$

$$H_1 = h_f + xh_{fg} = 2668.375 \text{ kJ/kg}$$

T	400	420	450
hg	3231	H2	3342

$$H_2 = 3275.8 \text{ kJ/kg}$$

$$Q_{1-2} = 607.425 \text{ kJ/kg}$$

$$Q_{2-3} = U_3 - U_2$$

$$U_3 = xug + (1-x)uf = 2477.95 \text{ kJ/kg}$$

T	400	420	450
ug	2933	U2	3020

$$U_2 = 2967.8 \text{ kJ/kg}$$

$$Q_{2-3} = 2967.8 \text{ kJ/kg}$$

$$Q_{3-1} = U_1 - U_3 + W$$

$$U_1 = xug + (1-x)uf = 2251.54 \text{ kJ/kg}$$

$$Q_{3-1} = -320.795 \text{ kJ/kg}$$

